Complete Summary

GUIDELINE TITLE

Policy statement: recommendations for the prevention of pneumococcal infections, including the use of pneumococcal conjugate vaccine (Prevnar), pneumococcal polysaccharide vaccine, and antibiotic prophylaxis.

BIBLIOGRAPHIC SOURCE(S)

Policy statement: recommendations for the prevention of pneumococcal infections, including the use of pneumococcal conjugate vaccine (Prevnar), pneumococcal polysaccharide vaccine, and antibiotic prophylaxis. Pediatrics 2000 Aug;106(2 Pt 1):362-6. [73 references]

COMPLETE SUMMARY CONTENT

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SCOPE

DISEASE/CONDITION(S)

Pneumococcal infections

GUIDELINE CATEGORY

Prevention

CLINICAL SPECIALTY

Family Practice
Pediatrics

INTENDED USERS

Advanced Practice Nurses
Nurses

Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To provide recommendations for use of the heptavalent pneumococcal conjugate vaccine (PCV7) (Prevnar) and 23-valent pneumococcal polysaccharide (23PS) vaccines
- To provide recommendations for the continuing use of antibiotic prophylaxis in children with sickle cell disease and asplenia and for the use of antibiotics and vaccines in children who attend out-of-home care

TARGET POPULATION

Pneumococcal Immunization

- Children ages 23 months and younger
- Children aged 24 to 59 months who have not been previously immunized and are at high risk for invasive pneumococcal infection (children with functional, anatomic, or congenital asplenia including sickle cell disease; infection with human immunodeficiency virus; and other predisposing conditions such as congenital immunodeficiency; chronic cardiopulmonary disease; children receiving immunosuppressive chemotherapy; children with immunosuppressive neoplastic diseases; chronic renal insufficiency, including nephrotic syndrome; diabetes; and children with cerebrospinal fluid leaks)
- Children at moderate risk for invasive pneumococcal infection, including all children 24-35 months of age, children 35-59 months of age attending out-of-home care, and children 36-59 months old who are of Native American and African American descent
- Healthy children 5 years of age and older
- Children with severe or recurrent otitis media

Antibiotic Prophylaxis

- Children with sickle cell disease and functional or anatomic asplenia

INTERVENTIONS AND PRACTICES CONSIDERED

1. Immunization with the following pneumococcal vaccines:
    - Heptavalent pneumococcal conjugate vaccine (PCV7; Prevnar)
    - 23-valent pneumococcal polysaccharide (23PS) vaccine (Pnu-Immune 23 and Pneumovax)
2. Antibiotic prophylaxis with oral administration of penicillin V potassium

MAJOR OUTCOMES CONSIDERED

- Immunogenicity (levels of protective antibody)
- Nasopharyngeal carriage of vaccine pneumococcal serotypes
- Incidence of invasive pneumococcal disease
- Incidence of pneumonia (clinically diagnosed pneumonia, radiographically confirmed pneumonia, consolidative pneumonias)

- Incidence and severity of otitis media
- Rate of tympanostomy tube placement
- Adverse effects

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

I. Evidence obtained from at least 1 properly randomized, controlled trial.

II-1. Evidence obtained from well-designed, controlled trials without randomization.

II-2. Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than 1 center or research group.

II-3. Evidence obtained from multiple time series with or without intervention. Dramatic results in uncontrolled experiments, such as the results of the introduction of penicillin treatment in the 1940s, could be regarded as this type of evidence.

III. Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

METHODS USED TO ANALYZE THE EVIDENCE

Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

The potential cost-effectiveness of a routine pneumococcal conjugate vaccine program in healthy children has been evaluated. Based on the annual birth cohort of 3.8 million infants, it was assumed that routine heptavalent pneumococcal CRM_{197} conjugate vaccine (PCV7) immunization would prevent 78% of annual pneumococcal meningitis cases (n=2219), 69% of annual bacteremia cases (n=52,319), and 7% of annual otitis media cases (n=1,009,505). This would result in net savings to society, if the cost of each dose of vaccine was $_{197}$ conjugate vaccine is $58/dose, or $232 for the infant doses, not including administration costs.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The evidence grades (I-III) are repeated at the end of the Major Recommendations.

Notice from the National Guideline Clearinghouse (NGC) and the American Academy of Pediatrics: On March 2, 2004, the Centers for Disease Control and Prevention (CDC), the American Academy of Pediatrics (AAP), and the American Academy of Family Physicians (AAFP), issued temporary recommendations to suspend routine use of both the third and fourth doses of pneumococcal conjugate vaccine (PCV7; Prevnar®). Children at increased risk of severe disease should continue to receive the full, routine, four-dose series. The recommendations were issued in response to a low vaccine supply. For more information, refer to the AAP Web site.

Recommended Immunization of All Children 23 Months and Younger

The heptavalent pneumococcal conjugate vaccine (PCV7) is recommended for routine administration to all children 23 months and younger at 2, 4, 6, and 12 to 15 months (see Table 1 below). Each .5-mL dose of heptavalent pneumococcal

conjugate vaccine should be administered intramuscularly. The initial 2-month dose should be given no earlier than 6 weeks of age. Infants of very low birth weight (≤1500 grams) should be immunized at the time that they attain a chronological age of 6 to 8 weeks, regardless of their calculated gestational age. All doses of heptavalent pneumococcal conjugate vaccine may be administered concurrently with other childhood immunizations, including all diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccines, all Haemophilus influenzae type b conjugate vaccines, both hepatitis B vaccines, inactivated poliovirus vaccine, measles-mumps-rubella vaccine, and varicella vaccine, using a separate syringe for the injection of each vaccine and administering each vaccine at a different site.

All children 23 months and younger who have not received doses of heptavalent pneumococcal conjugate vaccine before 6 months of age should be given catch-up doses according to the schedules in Table 1. Children 7 to 11 months old who have not previously received doses of heptavalent pneumococcal conjugate vaccine should receive 2 doses at least 6 to 8 weeks apart, followed by a third dose at 12 to 15 months of age or at least 6 to 8 weeks after the second dose. Children 12 to 23 months old who were not previously immunized should receive 2 doses at least 6 to 8 weeks apart.

Infants should begin the heptavalent pneumococcal conjugate vaccine immunization series in conjunction with other required vaccines at the time of the first regularly scheduled health maintenance visit after at least 6 weeks of age. Children 23 months or younger who begin a catch-up heptavalent pneumococcal conjugate vaccine immunization series at 7 months or older should start at the time of their next clinic visit, including those visits not related to well-child care unless contraindicated (e.g., moderate or severe febrile illness) (Evidence grade I).

Table 1-Recommended Schedule of Doses for Heptavalent Pneumococcal Conjugate Vaccine, Including Primary Series and Catch-Up Immunizations, in Previously Unvaccinated Children*

Age at First Dose	Primary Series	Booster Dose**
2-6 months	3 doses, 6-8 weeks apart	1 dose at 12-15 months of age
7-11 months	2 doses, 6-8 weeks apart	1 dose at 12-15 months of age
12-23 months	2 doses, 6-8 weeks apart	
≥24 months	1 dose	

*Recommendations for high-risk groups are given in Table 3 below.
**Booster doses to be given at least 6 to 8 weeks after the final dose of the primary series.

Recommended Immunization of Children 24 to 59 Months Old at High Risk of Invasive Pneumococcal Disease

The heptavalent pneumococcal conjugate vaccine is recommended for all children 24 to 59 months old who are at high risk for invasive pneumococcal infection (see Table 2 below). High-risk children include children with sickle cell disease and other types of functional or anatomic asplenia, human immunodeficiency virus (HIV) infection, or primary immunodeficiency and children who are receiving immunosuppressive therapy. Children at high risk of pneumococcal disease experience rates of infection that are at least 150/100 000. The following schedules are recommended for those high-risk children who are 24 to 59 months of age and who may have received previous doses of 23-valent pneumococcal polysaccharide vaccine or heptavalent pneumococcal conjugate vaccine (see Table 3, below).

1. For high-risk children who have received 4 doses of heptavalent pneumococcal conjugate vaccine, a dose of 23-valent pneumococcal polysaccharide vaccine is recommended at 24 months of age, to be given at least 6 to 8 weeks after the last dose of heptavalent pneumococcal conjugate vaccine.
2. For high-risk children who have received 1 to 3 doses of heptavalent pneumococcal conjugate vaccine before 24 months of age, a single additional dose of heptavalent pneumococcal conjugate vaccine should be given at least 6 to 8 weeks after the last dose of heptavalent pneumococcal conjugate vaccine. This should then be followed by a dose of 23-valent pneumococcal polysaccharide vaccine at least 6 to 8 weeks later. An additional dose of 23-valent pneumococcal polysaccharide vaccine should be given no earlier than 3 to 5 years after the initial dose of 23-valent pneumococcal polysaccharide vaccine.
3. For high-risk children 24 to 59 months old who have received only a single previous dose of 23-valent pneumococcal polysaccharide vaccine, there are minimal data regarding the safety of subsequent doses of pneumococcal conjugate vaccines. However, 2 doses of heptavalent pneumococcal conjugate vaccine are recommended, to be given at an interval of 6 to 8 weeks. Administration of the heptavalent pneumococcal conjugate vaccine immunization series should begin no earlier than 6 to 8 weeks after the last dose of 23-valent pneumococcal polysaccharide vaccine. An additional dose of 23-valent pneumococcal polysaccharide vaccine is recommended 3 to 5 years after the first dose of 23-valent pneumococcal polysaccharide vaccine.
4. For high-risk children 24 to 59 months old who have received no previous doses of either 23-valent pneumococcal polysaccharide vaccine or heptavalent pneumococcal conjugate vaccine, 2 doses of heptavalent pneumococcal conjugate vaccine are recommended, to be given at an interval of 6 to 8 weeks, followed by a single dose of 23-valent pneumococcal polysaccharide vaccine no less than 6 to 8 weeks after the last dose of heptavalent pneumococcal conjugate vaccine. An additional dose of 23-valent pneumococcal polysaccharide vaccine is recommended 3 to 5 years after the last dose.

Minimal safety and immunogenicity data are available regarding the use of combined regimens of heptavalent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine, and no data exist regarding the efficacy of these regimens for the prevention of pneumococcal disease. Currently available immunogenicity data suggest that heptavalent pneumococcal conjugate vaccine induces a primary immune response that will provide immune memory for the

boosting of antibody to some serotypes contained within 23-valent pneumococcal polysaccharide vaccine. Because 23-valent pneumococcal polysaccharide vaccine provides a potentially expanded serotype coverage, its use is recommended for high-risk children. However, previous experience with pneumococcal polysaccharide vaccines has suggested that repeated doses of 23-valent pneumococcal polysaccharide vaccine may be associated with an increased incidence of local reactions. Recommendations for the number of doses and the interval between doses of pneumococcal vaccines should be carefully observed (see Table 3 below) (Evidence grade II-2, III).

Table 2-Children at High Risk of Invasive Pneumococcal Infection

High-risk (attack rate of invasive pneumococcal disease >150/100,000 cases/year)	Sickle cell disease, congenital or acquired asplenia, or splenic dysfunction
	Infection with HIV
Presumed high risk (attack rate not calculated)	Congenital immune deficiency: some B- (humoral) or T-lymphocyte deficiencies, complement deficiencies (particularly C1, C2, C3, and C4 deficiencies), or phagocytic disorders (excluding chronic granulomatous disease)
	Chronic cardiac disease (particularly cyanotic congenital heart disease and cardiac failure)
	Chronic pulmonary disease (including asthma treated with high-dose oral corticosteroid therapy)
	Cerebrospinal fluid leaks
	Chronic renal insufficiency, including nephrotic syndrome
	Diseases associated with immunosuppressive therapy or radiation therapy (including malignant neoplasms, leukemias, lymphomas, and Hodgkin's disease) and solid organ transplantation*
	Diabetes mellitus
Moderate risk (attack rate of invasive pneumococcal	All children 24-35 months old
	Children 36-59 months old attending out-of-home care

disease >20 cases/100,000/year)	Children 36-59 months old who are of Native American (American Indian and Alaska Native) or African American descent

*Guidelines for the use of pneumococcal vaccines for children who have received bone marrow transplants are currently undergoing revision.

Table 3-Recommendations for Pneumococcal Immunization With heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide Vaccine for Children at High Risk of Pneumococcal Disease, as Defined in Table 2*

Age	Previous Doses	Recommendations
≤23 months	None	Heptavalent pneumococcal conjugate vaccine as in Table 1
24-59 months	4 doses of heptavalent pneumococcal conjugate vaccine	1 dose of 23-valent pneumococcal polysaccharide vaccine at 24 months, at least 6-8 weeks after last dose of heptavalent pneumococcal conjugate vaccine
		1 dose of 23-valent pneumococcal polysaccharide vaccine, 3-5 years after the first dose of 23-valent pneumococcal polysaccharide vaccine
24-59 months	1-3 doses of heptavalent pneumococcal conjugate vaccine	1 dose of heptavalent pneumococcal conjugate vaccine
		1 dose of 23-valent pneumococcal polysaccharide vaccine, 6-8 weeks after the last dose of heptavalent pneumococcal conjugate vaccine
		1 dose of 23-valent pneumococcal polysaccharide vaccine, 3-5 years after the first dose of 23-valent pneumococcal polysaccharide vaccine
24-59 months	1 dose of 23-valent pneumococcal polysaccharide	2 doses of heptavalent pneumococcal conjugate vaccine, 6-8 weeks apart, beginning at least 6-8 weeks after last dose of 23-valent pneumococcal polysaccharide vaccine
		1 dose of 23-valent pneumococcal polysaccharide vaccine, 3-5 years after the first dose of 23-valent pneumococcal polysaccharide vaccine
24-59 months	None	2 doses of heptavalent pneumococcal conjugate vaccine 6-8 weeks apart

		1 dose of 23-valent pneumococcal polysaccharide vaccine, 6-8 weeks after the last dose of heptavalent pneumococcal conjugate vaccine
		1 dose of 23-valent pneumococcal polysaccharide vaccine, 3-5 years after the first dose of 23-valent pneumococcal polysaccharide vaccine

*Children with sickle cell disease, asplenia, HIV infection, and other high-risk factors.

Immunization of Children 24 to 59 Months Old at Moderate Risk of Invasive Pneumococcal Infection

Currently available data are inadequate to recommend routine universal administration of heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine to children >24 months of age at moderate risk for invasive pneumococcal disease. Children at moderate risk experience attack rates of a least 20/100,000 but generally have rates less than those of high-risk children. Children at moderate risk include: all children 24 to 35 months old; children 36 to 59 months old who attend out-of-home care ($\geq$4 hours/week with at least 2 unrelated children); and children 36 to 59 months old who are of Native American (American Indian and Alaska Native) or African American descent. Other factors that may be considered when establishing priorities for possible elective immunization of children 24 to 59 months old with heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine include social or economic disadvantage, residence in crowded or substandard housing, homelessness; chronic exposure to tobacco smoke; or a history of severe or recurrent otitis media within the year before immunization or previous tympanostomy tube placement. Children for whom heptavalent pneumococcal conjugate vaccine is elected should be given the vaccine in the schedule listed in Table 1 above. Alternatively, the 23-valent pneumococcal polysaccharide vaccine can be given as a single dose for all children 2 years or older.

The relative merits of heptavalent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine given as a single dose in children older than 2 years have not been subjected to rigorous prospective comparative studies of immunogenicity, safety, or efficacy. Conjugate vaccines initiate immunologic memory and provide an enhanced immune response in children 24 to 59 months old. In children older than 2 years, antibody responses after administration of heptavalent pneumococcal conjugate vaccine are quantitatively and qualitatively greater (e.g., enhanced opsonization), compared with responses after administration of 23-valent pneumococcal polysaccharide vaccine. Unlike heptavalent pneumococcal conjugate vaccine, immune responses, young children fail to respond to some serotypes in the 23-valent pneumococcal polysaccharide vaccine, including some serotypes included in the conjugate vaccine. Immune responses to all pneumococcal serotypes may not occur after injection of the 23-valent pneumococcal polysaccharide vaccine until children are 5 or more years old. Further, the duration of antibody responses is greater after administration of heptavalent pneumococcal conjugate vaccine. Conjugate vaccines similar to heptavalent pneumococcal conjugate vaccine have reduced nasopharyngeal

carriage of vaccine serotypes and may provide a secondary benefit by limiting spread of invasive serotypes among young children. A single dose of 23-valent pneumococcal polysaccharide vaccine has been recommended since 1985 for children 2 years or older who are at risk of pneumococcal disease. The 23-valent pneumococcal polysaccharide vaccine provides potential protection against an expanded number of serotypes, and the cost of 23-valent pneumococcal polysaccharide vaccine is considerably less than that of heptavalent pneumococcal conjugate vaccine. Data regarding the efficacy of 23-valent pneumococcal polysaccharide vaccine are conflicting, but 2 recent studies have suggested that 23-valent pneumococcal polysaccharide vaccine may provide modest protection in children.

Therefore, either heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine can be used for elective administration to children 24 to 59 months old. A single dose of each vaccine has been administered safely to children. Based on the considerations reviewed above, heptavalent pneumococcal conjugate vaccine is the preferred vaccine. However, until further data are available, 23-valent pneumococcal polysaccharide vaccine is an acceptable alternative for children older than 2 years when economic or other barriers prohibit the use of heptavalent pneumococcal conjugate vaccine. If heptavalent pneumococcal conjugate vaccine is used, a single dose of 23-valent pneumococcal polysaccharide vaccine after administration of heptavalent pneumococcal conjugate vaccine should be considered, particularly in children of American Indian descent, to provide broadened pneumococcal coverage against serotypes not contained within heptavalent pneumococcal conjugate vaccine. In recent studies, heptavalent pneumococcal conjugate vaccine has provided coverage for <50% of invasive serotypes in Native American children. The dose of 23-valent pneumococcal polysaccharide vaccine should be given no earlier than 6 to 8 weeks after the last dose of heptavalent pneumococcal conjugate vaccine (Evidence grade III).

Immunization of Healthy Children 5 Years and Older

Health care professionals also may elect immunization with heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine for certain children 60 months or older. The risks for invasive pneumococcal disease are much lower for children 60 months or older. No efficacy data and limited safety and immunogenicity data are available on which to base a recommendation for the use of heptavalent pneumococcal conjugate vaccine in children 5 years and older. Studies of small numbers of children with sickle cell disease and HIV suggest that heptavalent pneumococcal conjugate vaccine is safe and immunogenic when administered to children up to 13 years old. Therefore, administration of a single dose of heptavalent pneumococcal conjugate vaccine to children of any age, particularly children at high risk for invasive pneumococcal infection, is not contraindicated. However, 23-valent pneumococcal polysaccharide immunization also may be effective and immunogenic in older children at increased risk of invasive or severe respiratory tract infections caused by pneumococci. Therefore, immunization with a single dose of heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine is acceptable. If both vaccines are used, then the administration of each should be separated by 6 to 8 weeks (Evidence grade III).

Use of Pneumococcal Vaccine in Children with Severe or Recurrent Otitis Media

Pneumococcal polysaccharide vaccines have not reduced the incidence of acute otitis media in children of any age and, therefore, 23-valent pneumococcal polysaccharide vaccine is not recommended for the prevention of acute otitis media. The heptavalent pneumococcal conjugate vaccine has provided a modest reduction (<10%) in the incidence of acute otitis media in children with a history of recurrent acute otitis media, as defined by at least 3 or more episodes in 6 months or 4 or more episodes in the year before the administration of the vaccine. However, heptavalent pneumococcal conjugate vaccine may be beneficial for children 24 to 59 months old who have not received pneumococcal vaccines previously and who have a history of recurrent acute otitis media, or for children who have acute otitis media complicated by placement of tympanostomy tubes (Evidence grade I).

Control of Transmission of Pneumococcal Infection and Invasive Disease Among Children Attending Out-of-Home Care

Rates of invasive pneumococcal infection among children attending out-of-home care are twofold to threefold higher than among other healthy children of the same age not enrolled in out-of-home care (defined as at least 4 hours per week in out-of-home care shared with at least 2 unrelated children). The 23-valent pneumococcal polysaccharide immunization does not reduce nasopharyngeal carriage of pneumococci. Insufficient data are available regarding the efficacy of heptavalent pneumococcal conjugate vaccine in preventing or interrupting nasopharyngeal carriage or transmission of pneumococcal infection in out-of-home-care settings where one or more invasive pneumococcal infections have occurred. Current data suggest that there is approximately a 50% decrease in nasopharyngeal carriage of vaccine serotypes among children who receive pneumococcal conjugate vaccines, but there may be replacement of vaccine serotypes with nonvaccine serotypes. Therefore, until more data are available, routine immunization with heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine is not recommended for children in out-of-home care, but the elective use of either vaccine is not contraindicated. In addition, available data are insufficient to recommend any antibiotic regimen for preventing or interrupting the carriage or transmission of pneumococcal infection in these settings (Evidence grade III).

General Recommendations for Use of Pneumococcal Vaccines

1. Either 23-valent pneumococcal polysaccharide vaccine or heptavalent pneumococcal conjugate vaccine may be given concurrently with other vaccines. Either pneumococcal vaccine should be injected with a separate syringe in a separate site when administered with other vaccines. The concurrent administration of pneumococcal vaccines with measles-mumps-rubella vaccine, varicella vaccine, diphtheria and tetanus toxoids and acellular pertussis (DTaP) vaccine, inactivated poliovirus vaccine, oral poliovirus vaccine, Haemophilus influenzae type b conjugate (HbOC) vaccine, or hepatitis B vaccine has not been shown to meaningfully impair the immune response to other vaccines or pneumococcal vaccines. Rates of local reactions after administration of heptavalent pneumococcal conjugate vaccine are

comparable with those of Haemophilus influenzae type b conjugate vaccine, but fever and local reactions occur more often. Data are not available on the immunogenicity or adverse reactions with concurrent administration of Haemophilus protein conjugate vaccines other than Haemophilus influenzae type b conjugate (CRM). The heptavalent pneumococcal conjugate vaccine does not contain thimerosal (Evidence grade I).

2. When elective splenectomy is performed for any reason, scheduled immunization with heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine should be performed at least 2 weeks before splenectomy. Immunization should precede the initiation of immune-compromising therapy by at least 2 weeks (Evidence grade III).
3. In general, pneumococcal vaccines should be deferred during pregnancy, because the effects on the fetus are unknown, and immunization during pregnancy poses a theoretical risk to the developing fetus. However, inactivated or killed vaccines, including other experimental and licensed polysaccharide vaccines such as group B streptococcal and 23-valent pneumococcal polysaccharide vaccines, have been administered safely during pregnancy. A high risk of severe pneumococcal disease in a pregnant woman should be considered when making decisions regarding the need for pneumococcal immunization, and 23-valent pneumococcal polysaccharide vaccine can be given during pregnancy. Household contacts of pregnant women may be given either vaccine (Evidence grade III).

Use of Antibiotic Prophylaxis in Children with Sickle Cell Disease and Functional or Anatomic Asplenia

Antibiotic prophylaxis is recommended for all children with sickle cell disease and functional or anatomic asplenia, regardless of whether they have received pneumococcal immunizations. Although the efficacy of penicillin prophylaxis in children with functional or anatomic asplenia other than sickle cell disease has not been studied, it is reasonable to use prophylaxis in the same regimen. Antibiotic prophylaxis should be begun before 2 months of age or as soon as sickle cell disease or asplenia occurs or is otherwise recognized or suggested by screening procedures. Oral administration of penicillin V potassium is recommended at a dosage of 125 mg twice a day until 3 years of age and at a dosage of 250 mg twice a day after 3 years of age. Children who have not experienced invasive pneumococcal infection and have received recommended pneumococcal immunizations may discontinue penicillin prophylaxis after 5 years of age (Evidence grade I).

Pneumococcal Immunization of Children with a Past History of Pneumococcal Disease

Children who have experienced invasive pneumococcal disease should receive all recommended doses of pneumococcal immunization (heptavalent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine) appropriate for their age and underlying condition. The full series of scheduled doses should be completed even if the series is interrupted by an episode of invasive pneumococcal disease.

Evidence Grading

I. Evidence obtained from at least one properly randomized, controlled trial.

II-1. Evidence obtained from well-designed, controlled trials without randomization.

II-2. Evidence obtained from well-designed cohort or case-control analytic studies, preferably from >1 center or research group.

II-3. Evidence obtained from multiple time series with or without intervention. Dramatic results in uncontrolled experiments, such as the results of the introduction of penicillin treatment in the 1940s, could be regarded as this type of evidence.

III. Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Streptococcus pneumoniae is the most common cause of bacteremia, sepsis, meningitis, pneumonia, sinusitis, and acute otitis media in children. Pneumococcal disease, other than sepsis and meningitis, also is associated with considerable morbidity in children. Efficacy trials of pneumococcal conjugate vaccines showed a decrease in invasive infections (93%), consolidative pneumonia (73%), otitis media (7%), and tympanostomy tube replacement (20%).

Continuous penicillin prophylaxis in children younger than 5 years with sickle cell disease has been successful in reducing rates of pneumococcal disease by 84%.

POTENTIAL HARMS

The heptavalent pneumococcal conjugate vaccine has been associated with an acceptable incidence of adverse effects when given at 2, 4, 6, and 12 to 15 months of age with concurrent administration of recommended, age-appropriate vaccines (diphtheria and tetanus toxoids and acellular pertussis [DTaP], Haemophilus influenzae type b conjugate [HbOC], diphtheria and tetanus toxoids and pertussis [DTP]/HbOC, hepatitis B, oral poliovirus [OPV], inactivated poliovirus [IPV], and measles-mumps-rubella [MMR] and varicella vaccine),

compared with the administration to children of a control investigational vaccine of meningococcal C polysaccharide conjugated to CRM. No hepatitis A vaccine has been given concurrently with heptavalent pneumococcal conjugate vaccine.

Available data suggest that heptavalent pneumococcal conjugate vaccine may prove to be among the most reactogenic (e.g., local reactions and incidence of fever) vaccine of those currently used, including the diphtheria and tetanus toxoids and acellular pertussis and Haemophilus conjugate vaccines. Moderate local reactions (any erythema $\geq$2.4 cm and/or tenderness) occurred at the injection site in 4.9% to 6.1% of children after all doses, without a statistically significant increase in the number or severity of these reactions with any subsequent dose in the series. The fourth dose (given with diphtheria and tetanus toxoids and acellular pertussis and measles-mumps-rubella) was associated with the fewest local reactions. Young infants experienced local reactions at the heptavalent pneumococcal conjugate vaccine site less often than at the diphtheria and tetanus toxoids and pertussis/Hemophilus influenzae type b conjugate site.

The incidence of fever (body temperature $\geq$38 degrees C within 48 hours of vaccination) occurred in a greater proportion of children in the heptavalent pneumococcal conjugate vaccine group than in those who received the meningococcal C conjugate vaccine when administered with diphtheria and tetanus toxoids and pertussis/Haemophilus influenzae type b conjugate or diphtheria and tetanus toxoids and acellular pertussis. The incidence of fever was nearly twofold higher in children receiving heptavalent pneumococcal conjugate vaccine, compared with children who received the meningococcal vaccine, despite a high rate of antipyretic use in both groups. Fever is most common after the second or third dose of heptavalent pneumococcal conjugate vaccine when given concurrently with diphtheria and tetanus toxoids and pertussis/Haemophilus influenzae type b conjugate. Drowsiness occurred in 27.4% to 48.9%, fussiness occurred in 37.6% to 39.9%, and decreased appetite occurred in 12.7% to 17.8% of children given diphtheria and tetanus toxoids and acellular pertussis, Haemophilus influenzae type b vaccine, and oral poliovirus or inactivated poliovirus with heptavalent pneumococcal conjugate vaccine. In addition to higher rates of fever in children receiving heptavalent pneumococcal conjugate vaccine, there was more frequent use of antipyretics than in children who received meningococcal conjugate vaccines. Body temperatures of at least 38 degrees C and higher than 39 degrees C were reported in 13% and 1.2%, respectively, of 727 children who received heptavalent pneumococcal conjugate vaccine without any concurrent vaccines. This small group of children also experienced irritability (45.8%), drowsiness (15.9%), restless sleep (21.2%), decreased appetite (18.3%), vomiting (6.3%), diarrhea (12.8%), and rash or hives (1.2%; U.S. Food and Drug Administration package insert).

Limited safety and immunogenicity trials of heptavalent pneumococcal conjugate vaccine have been completed in children with sickle cell disease. In 1 trial, 24 children 2 years or older with sickle cell disease were given 2 doses of heptavalent pneumococcal conjugate vaccine at an 8-week interval, followed 8 weeks later by a single dose of 23-valent pneumococcal polysaccharide (23PS) vaccine with or without a third dose of heptavalent pneumococcal conjugate vaccine. Fever was reported by 3 of 11 subjects after the first dose of heptavalent pneumococcal conjugate vaccine, by 1 of 11 after the second dose, and by 4 of 11 after the third dose of those who received the combined regimen (heptavalent pneumococcal

conjugate vaccine plus 23-valent pneumococcal polysaccharide vaccine) and by 2 of 11 of those who received 23-valent pneumococcal polysaccharide vaccine alone. Local reactions of swelling and erythema were similar in those children who received 23-valent pneumococcal polysaccharide vaccine alone, compared with those who received a combined regimen of heptavalent pneumococcal vaccine and 23-valent pneumococcal polysaccharide vaccine (median: 4.0 and 3.5 cm, respectively; range: 0-14 cm), but they were more frequent than in those children receiving priming doses of heptavalent pneumococcal conjugate vaccine (median: 1.0 cm; range: 0-16 cm).

Previous experience with pneumococcal polysaccharide vaccines has suggested that repeated doses of 23-valent pneumococcal vaccine may be associated with an increased incidence of local reactions.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Staying Healthy

IOM DOMAIN

Effectiveness
Safety

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Policy statement: recommendations for the prevention of pneumococcal infections, including the use of pneumococcal conjugate vaccine (Prevnar), pneumococcal polysaccharide vaccine, and antibiotic prophylaxis. Pediatrics 2000 Aug;106(2 Pt 1):362-6. [73 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2000 Aug

GUIDELINE DEVELOPER(S)

American Academy of Pediatrics - Medical Specialty Society

SOURCE(S) OF FUNDING

American Academy of Pediatrics

GUIDELINE COMMITTEE

Committee on Infectious Diseases

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Committee on Infectious Diseases, 1999-2000: Jon S. Abramson, MD, Chairperson; Carol J. Baker, MD; Margaret C. Fisher, MD; Michael A. Gerber, MD; Cody Meissner, MD; Dennis L. Murray, MD; Gary D. Overturf, MD; Charles G. Prober, MD; Margaret B. Rennels, MD; Thomas N. Saari, MD; Leonard B. Weiner, MD; Richard J. Whitley, MD

Ex-officio Members: Georges Peter, MD; Larry K. Pickering, MD; Noni E. MacDonald, MD

Liaisons: Lance Chilton, MD (Pediatric Practice Action Group); Richard F. Jacobs, MD (American Thoracic Society); Gilles Delage, MD (Canadian Paediatric Society); Scott F. Dowell, MD, MPH (Centers for Disease Control and Prevention); Walter A. Orenstein, MD (Centers for Disease Control and Prevention); Peter A. Patriarca, MD (Food and Drug Administration); Martin G. Myers, MD (National Vaccine Program Office)

Consultant: Edgar O. Ledbetter, MD

Staff: Joann Kim, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline. This guideline updates information previously published by the American Academy of Pediatrics (AAP)

(Recommendations for using pneumococcal vaccine in children. Pediatrics 1985;75:1153-118; Pneumococcal infections. In: Peter G, ed. 1997 Red Book: Report of the Committee on Infectious Diseases. 24th ed. Elk Grove Village, IL: American Academy of Pediatrics; 1997. pp 410-9; Therapy for children with invasive pneumococcal infections. Pediatrics 1997;99:289-99).

AAP Policies are reviewed every 3 years by the authoring body, at which time a recommendation is made that the policy be retired, revised, or reaffirmed without change. Until the Board of Directors approves a revision or reaffirmation, or retires a statement, the current policy remains in effect.

GUIDELINE AVAILABILITY

Electronic copies: Available from the American Academy of Pediatrics (AAP) Policy Web site.

Print copies: Available from AAP, 141 Northwest Point Blvd., P.O. Box 927, Elk Grove Village, IL 60009-0927.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Overturf G and the Committee on Infectious Diseases. Technical report: Prevention of pneumococcal infections, including the use of pneumococcal conjugate and polysaccharide vaccines and antibiotic prophylaxis. Pediatrics 2000 Aug;106(2 Pt 1):367-76.

Electronic copies: Available from the American Academy of Pediatrics (AAP) Policy Web site.

Print copies: Available from AAP, 141 Northwest Point Blvd., P.O. Box 927, Elk Grove Village, IL 60009-0927.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on September 17, 2001. The information was verified by the guideline developer as of December 5, 2001.

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